

PM_{2.5} Continuous FEMs; Update and Assessments

For Region 4 Monitoring Meeting

Tim Hanley – US EPA, OAQPS

Background

- One of the Primary Objectives of the Ambient Air Monitoring Strategy for State, Local, and Tribal Air Agencies

“Encourage the use of continuous ...methods...to provide easy access to timely, high-quality, high-resolution air quality data.”

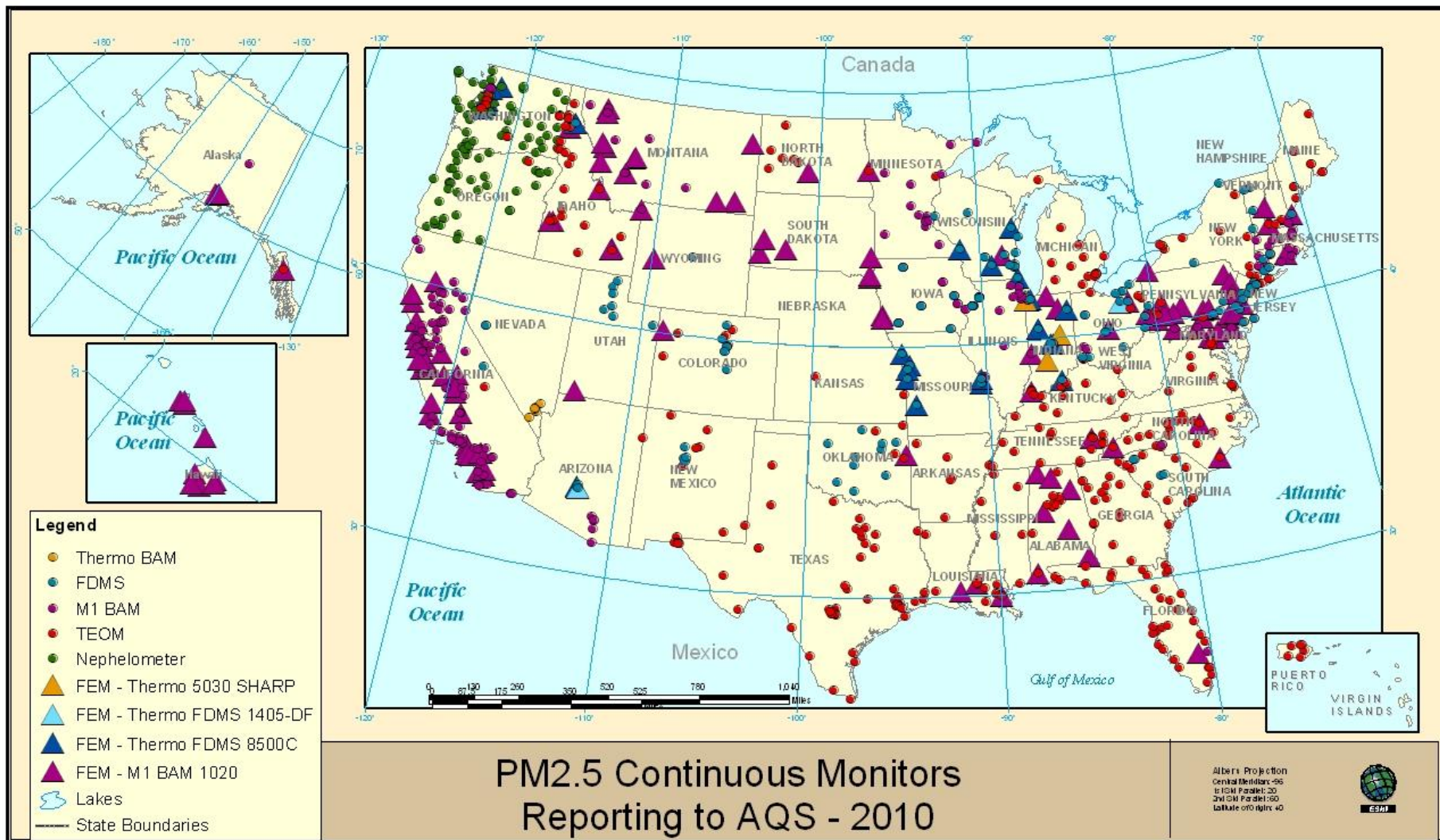
- Monitoring Final Rule in 2006 included new performance criteria and testing requirements for approval of PM_{2.5} Class III continuous Methods
- Six PM_{2.5} continuous methods have been approved as Class III FEMs.

Approved PM_{2.5} Class III FEMs

- Met One BAM-1020 Monitor – EQPM-0308-170
- Thermo Scientific Model 5014i or FH62C14-DHS – EQPM-0609-183
- Thermo Scientific Model 5030 SHARP – EQPM-0609-184
- Thermo Scientific Series 8500C FDMS – EQPM-0609-181
- Thermo Scientific 1405-DF FDMS – EQPM-0609-182
- GRIMM Model EDM 180 PM_{2.5} Monitor – EQPM-0311-195

Summary of Operating PM_{2.5} FEMs:

Method Description	Method Code	Monitors Reporting to AQS – Nov. '10
Met One BAM-1020	170	67
Thermo 8500C FDMS	181	24
Thermo 1405-DF FDMS	182	1
Thermo 5014i or FH62C14-DHS	183	0
Thermo 5030 SHARP	184	2
GRIMM EDM 180	195	0



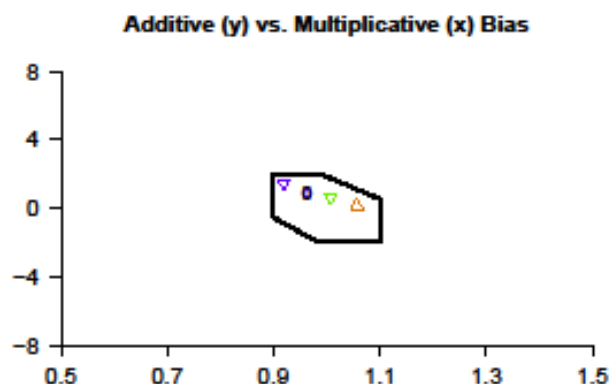
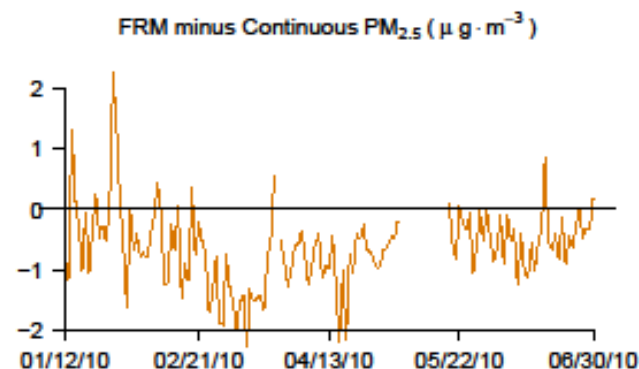
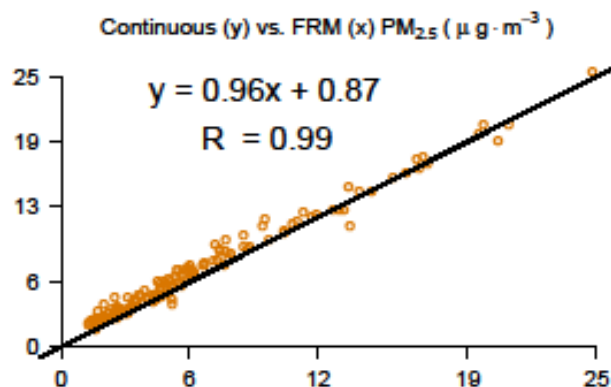
What have we done to help monitoring agencies as they start to use and produce data from FEMs?

- **SOPs** - Development of consensus SOPs for PM_{2.5} continuous FEMs; first two available now as drafts. While both SOPs are in very good shape there are a few things that need to be updated, especially now that we are seeing the data quality.
 - **Met One BAM 1020**
 - http://www.epa.gov/ttn/amtic/files/ambient/pm25/sop_project/905505_BAM_SOP_Draft_Final_Oct09.doc
 - **Thermo 1405DF FDMS**
 - http://www.epa.gov/ttn/amtic/files/ambient/pm25/sop_project/905505_TEOM_SOP_Draft_Final_Sept09.doc
 - Thermo 8500C FDMS – Recently delivered from STI - looking for Reviewers; please contact Tim Hanley at: hanley.tim@epa.gov
- **Technical Note on Data Reporting** - Anticipating new data from PM_{2.5} continuous FEMs, OAQPS issued a technical note to address implementation, reporting, and use of the data from FEMs (and ARMs if any become approved) in the SLAMS network:

Implementing Continuous PM_{2.5} Federal Equivalent Methods (FEMs) and Approved Regional Methods (ARMs) in State or Local Air Monitoring Stations (SLAMS) Networks
Richard A. Wayland to Regional Air Division Directors, July 24, 2008

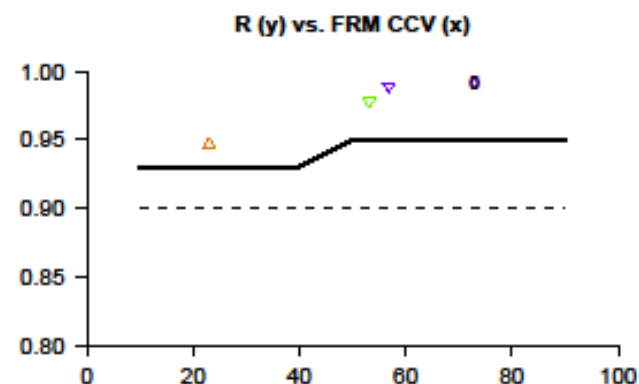
Information is now available to begin assessing quality of PM_{2.5} FEM's

Site 53-053-0029: Tacoma, WA Thermo Scientific 8500C FDMS w/VSCC



Mean PM_{2.5} ($\mu\text{g} \cdot \text{m}^{-3}$)

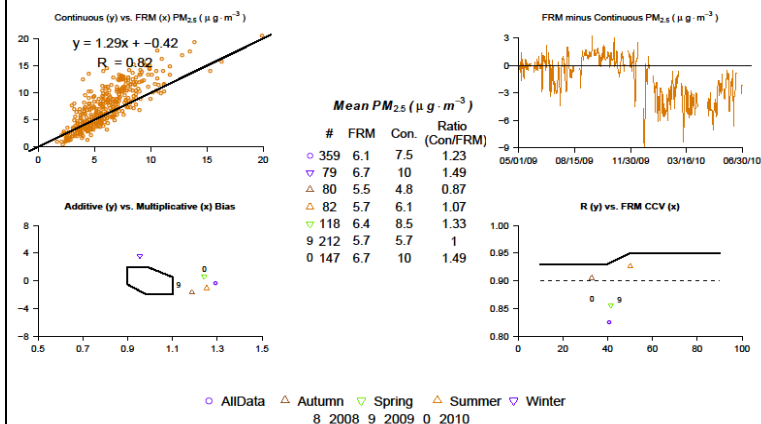
#	FRM	Con.	Ratio (Con/FRM)
○ 140	6.3	7	1.11
▽ 59	9.6	10.3	1.07
△ 10	3.6	3.9	1.08
▽ 71	4	4.7	1.18
○ 140	6.3	7	1.11



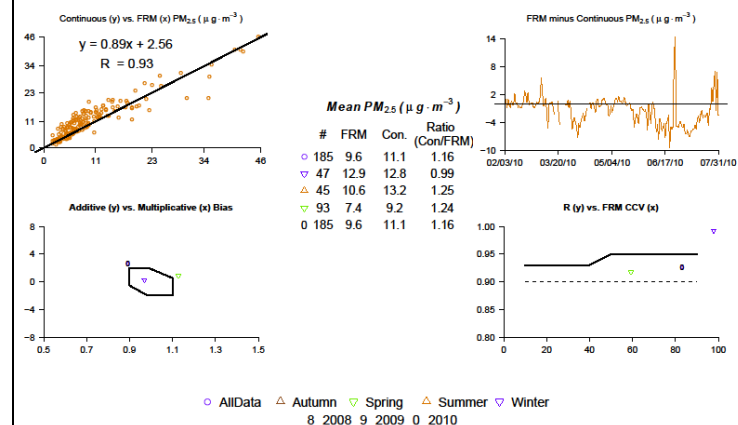
○ AllData △ Autumn ▽ Spring △ Summer ▽ Winter
8 2008 9 2009 0 2010

Information is now available to begin assessing quality of PM_{2.5} FEM data

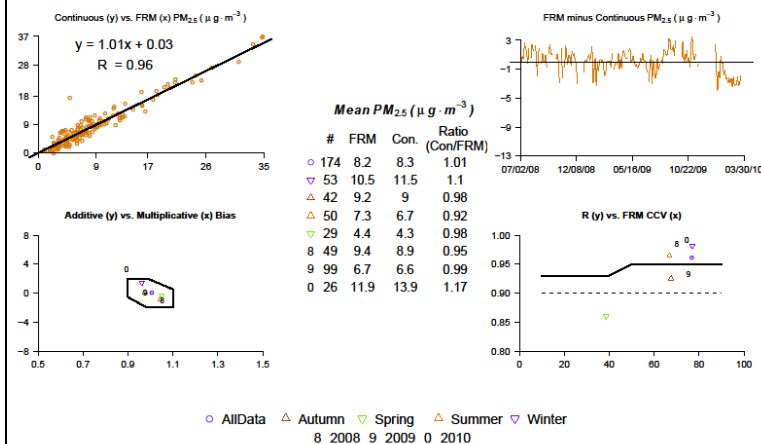
Site 12-099-0008: Belle Glade, FL
Met One BAM-1020 Mass Monitor w/VSCC



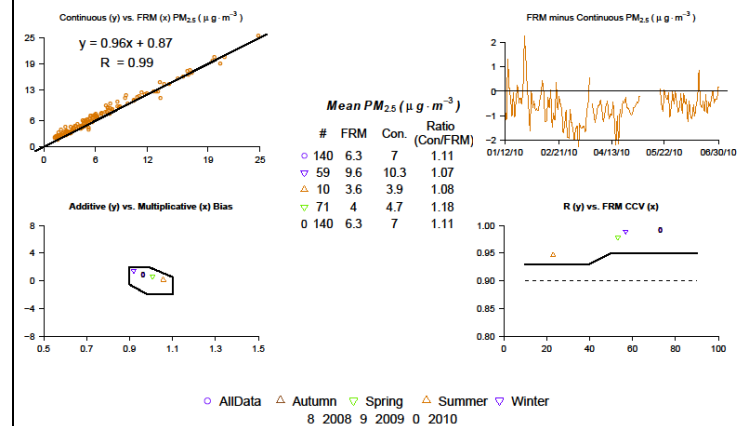
Site 55-09-0005: Green Bay, WI
Thermo Scientific 8500C FDMS w/VSCC



Site 30-081-0007: Hamilton, MT
Met One BAM-1020 Mass Monitor w/VSCC



Site 53-053-0029: Tacoma, WA
Thermo Scientific 8500C FDMS w/VSCC

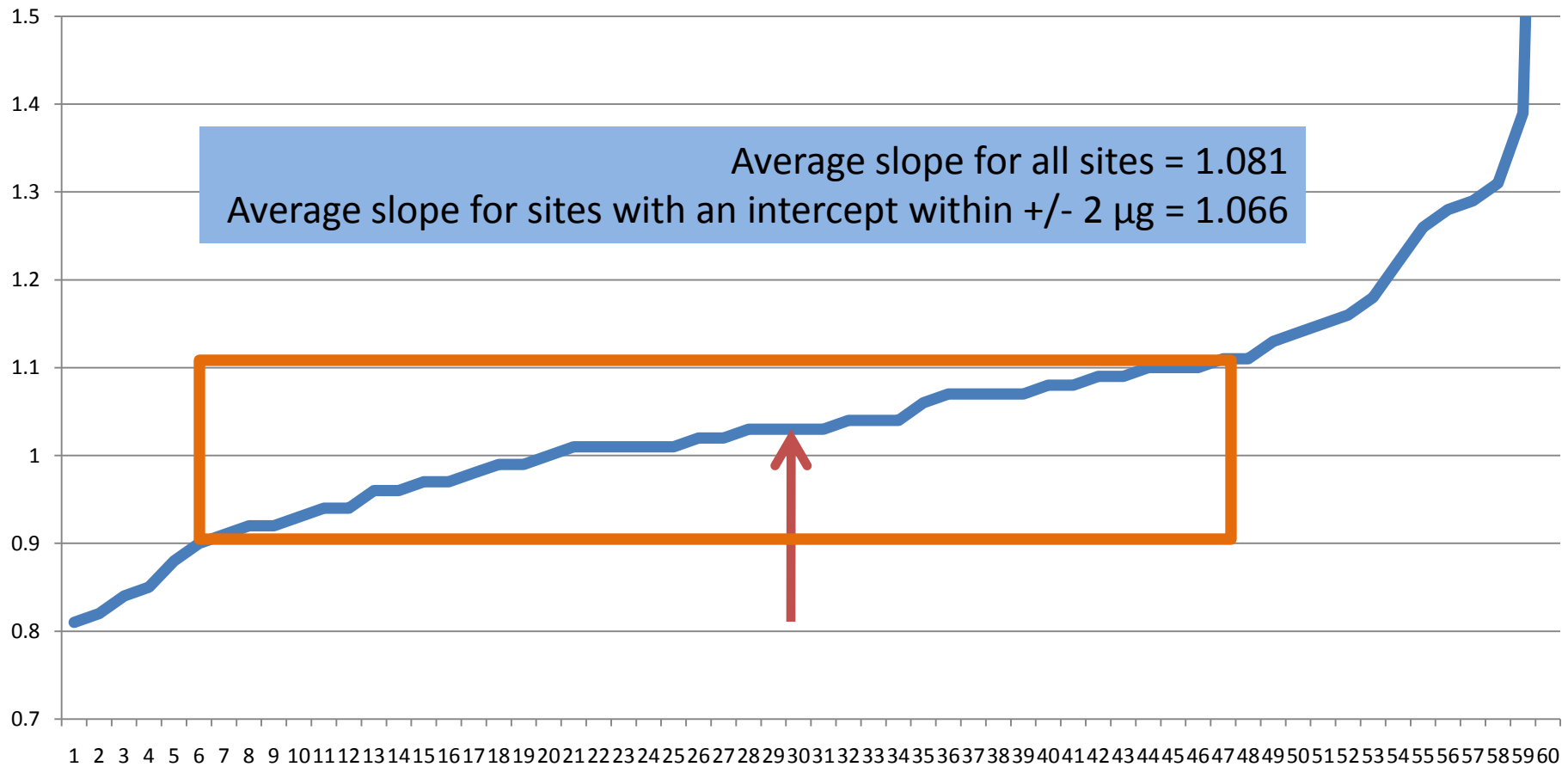


Met One BAM 1020 - FEM

- One-page detailed assessments are available for FEMs that have submitted data to AQS as of Fall 2010.
- 60 sites have Met One BAM 1020 FEM data with at least 23 data pairs (FRM and FEM from the same day)
- In this ppt - took a look at slope, intercept, and ratio of FRM to FEM concentrations.
- R was not looked at in detail, but is included in one-page assessments

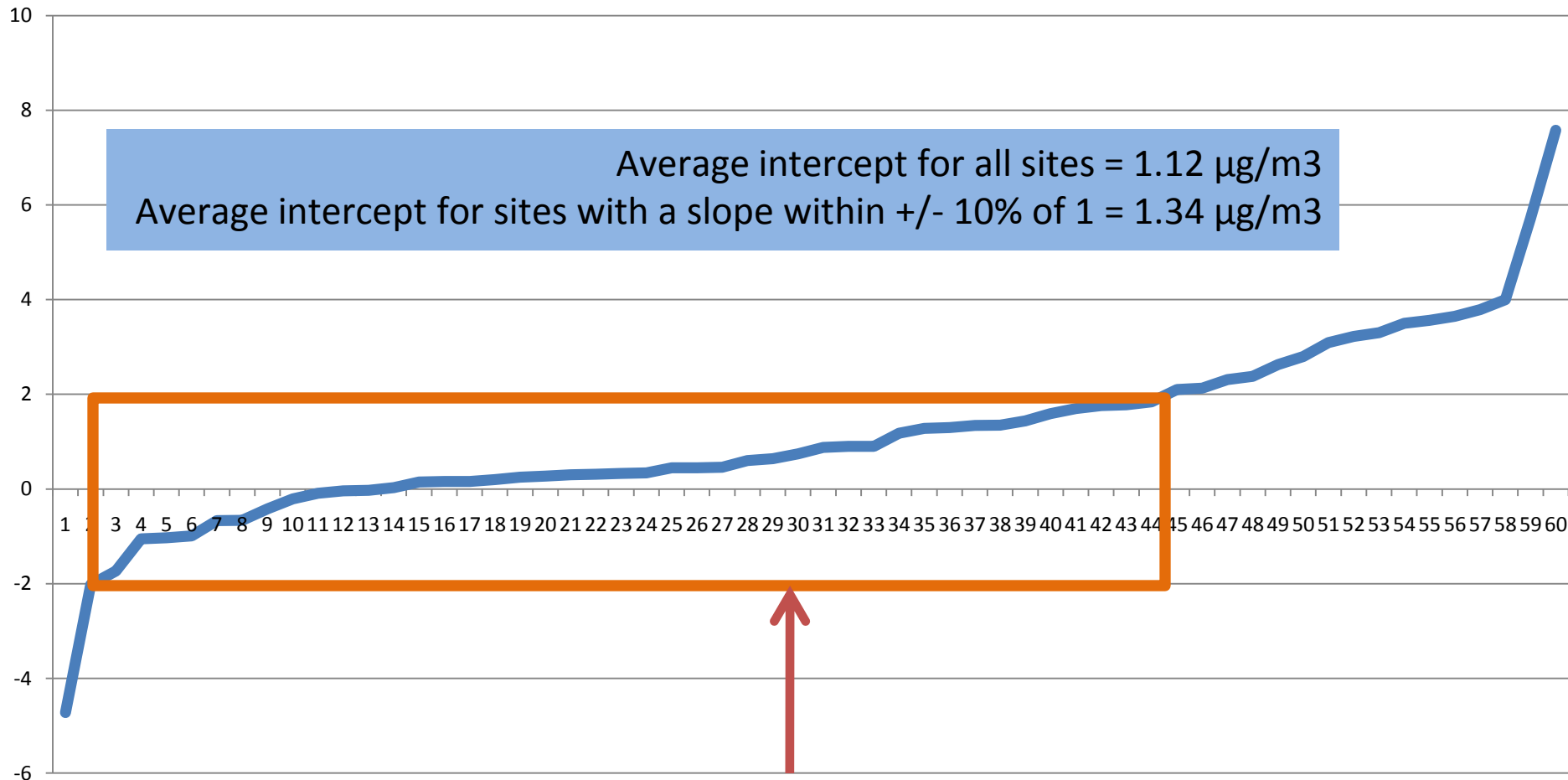
Met One BAM 1020 - FEM

Slope



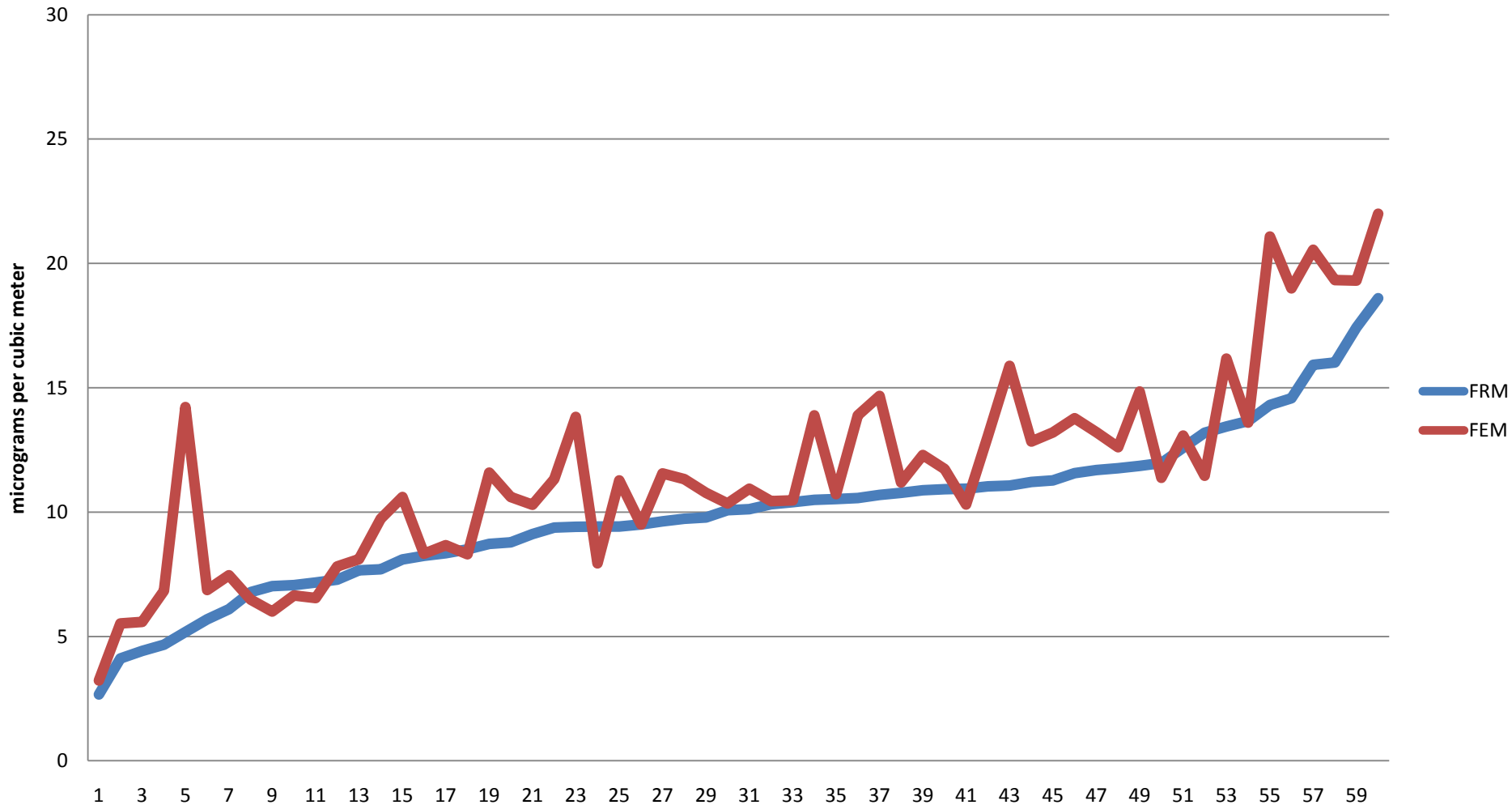
Met One BAM 1020 - FEM

Intercept ($\mu\text{g}/\text{m}^3$)



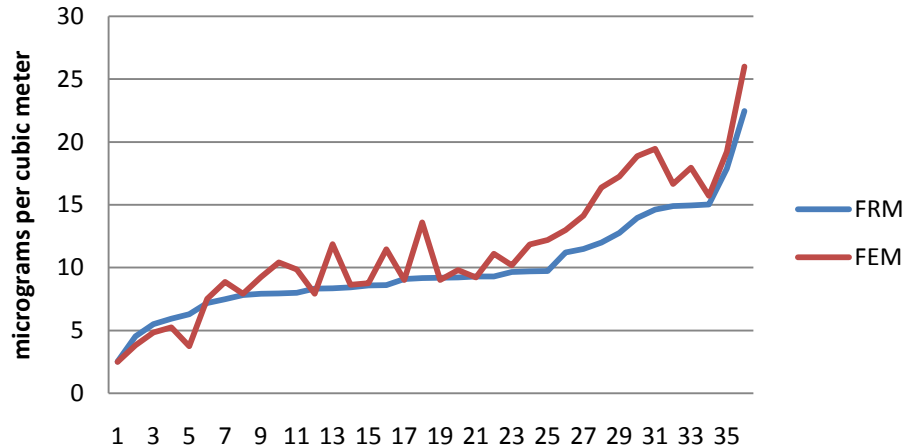
Met One BAM 1020 - FEM

Mean Concentrations - All Seasons

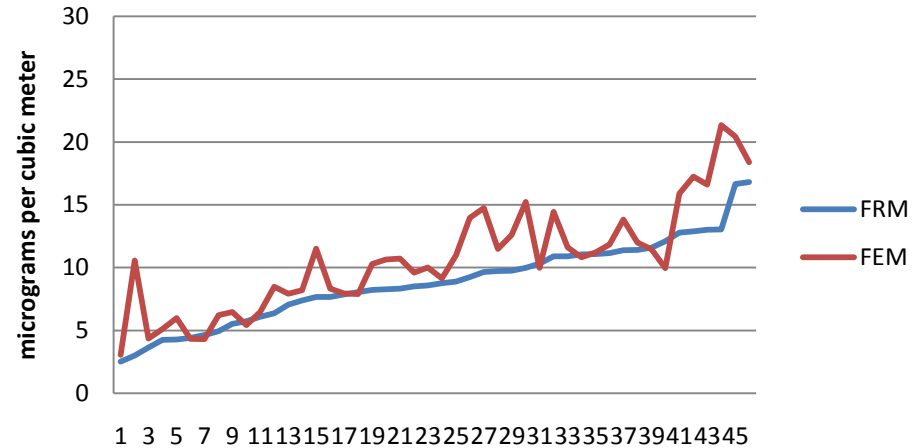


Met One BAM 1020 - FEM

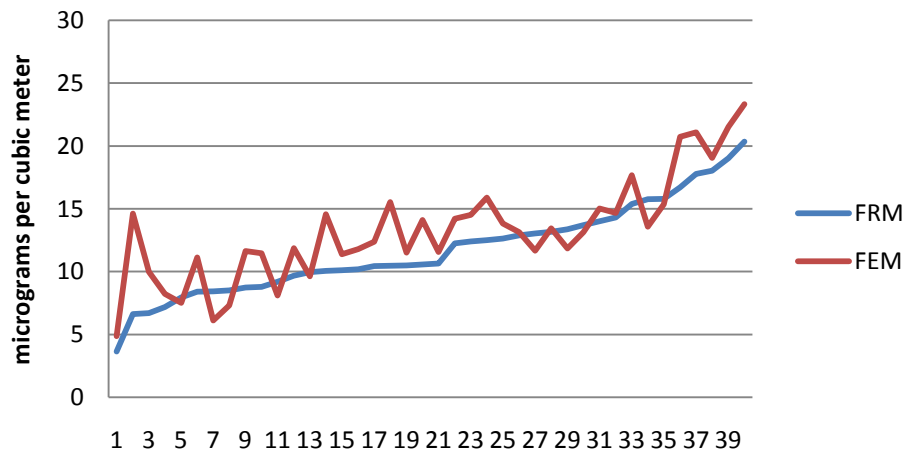
Mean Concentrations for Fall



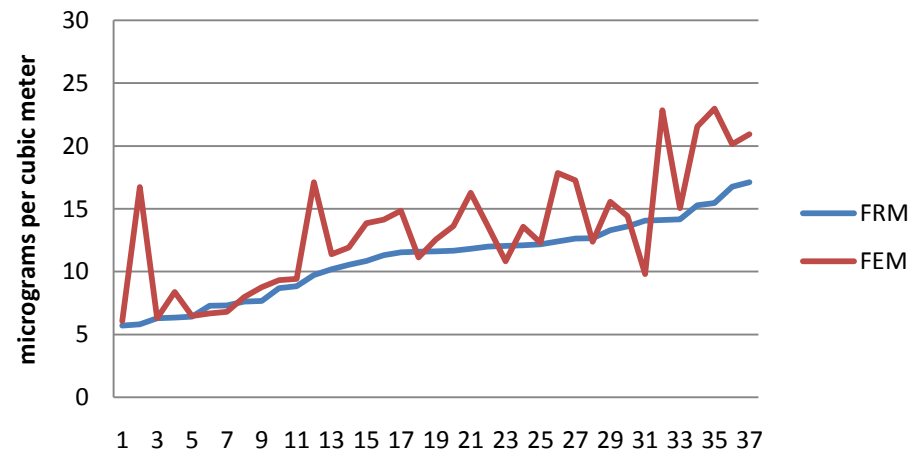
Mean Concentrations for Spring



Mean Concentrations for Winter



Mean Concentrations for Summer

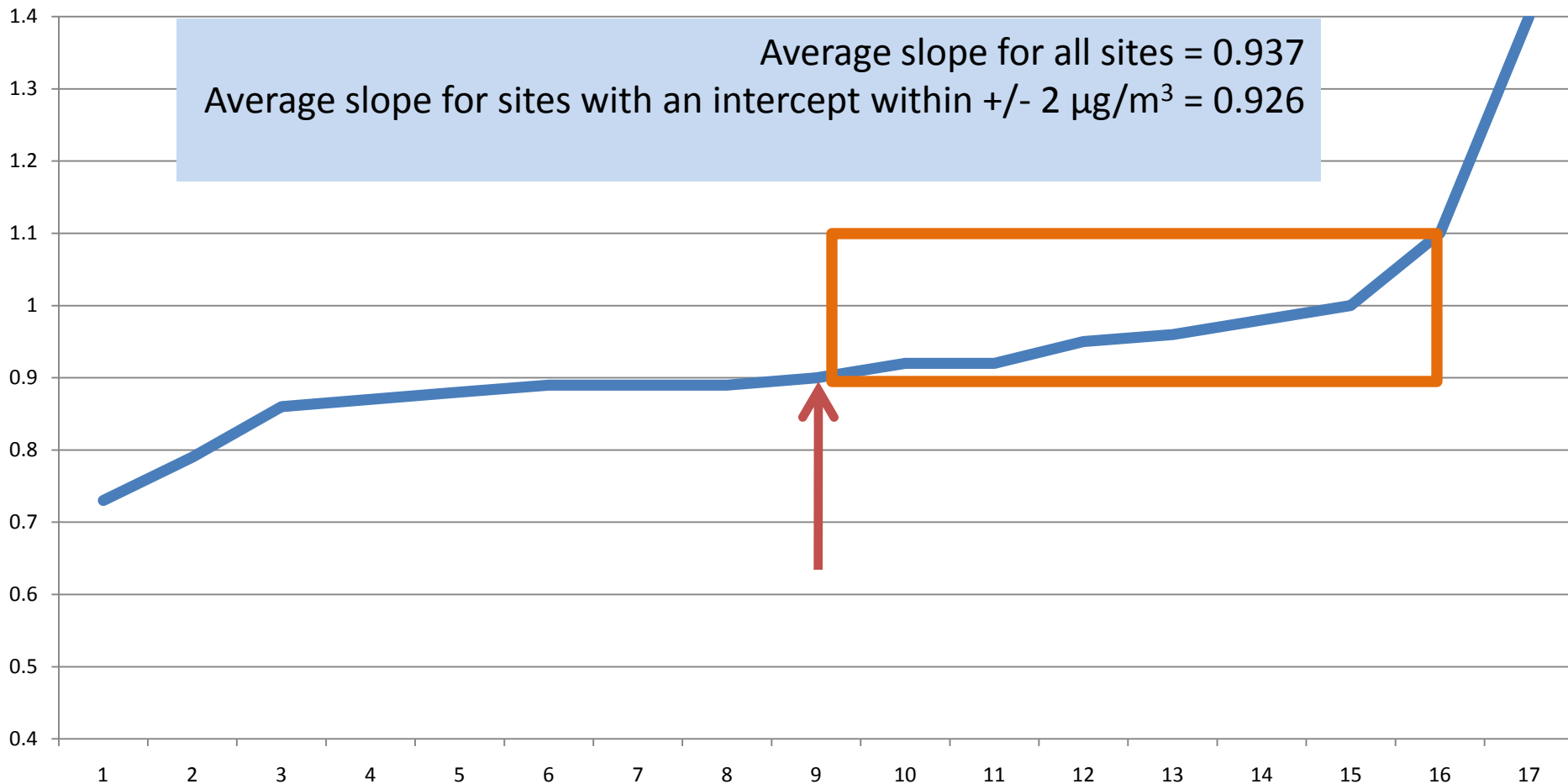


8500C FDMS - FEM

- One-page detailed assessments are available for FEMs that have submitted data to AQS as of Fall 2010.
- 17 sites have 8500C FDMS FEM data with at least 23 data pairs (FRM and FEM from the same day)
- In this ppt - took a look at slope, intercept, and ratio of FRM to FEM concentrations.
- R was not looked at in detail, but is included in one-page assessments

8500C FDMS - FEM

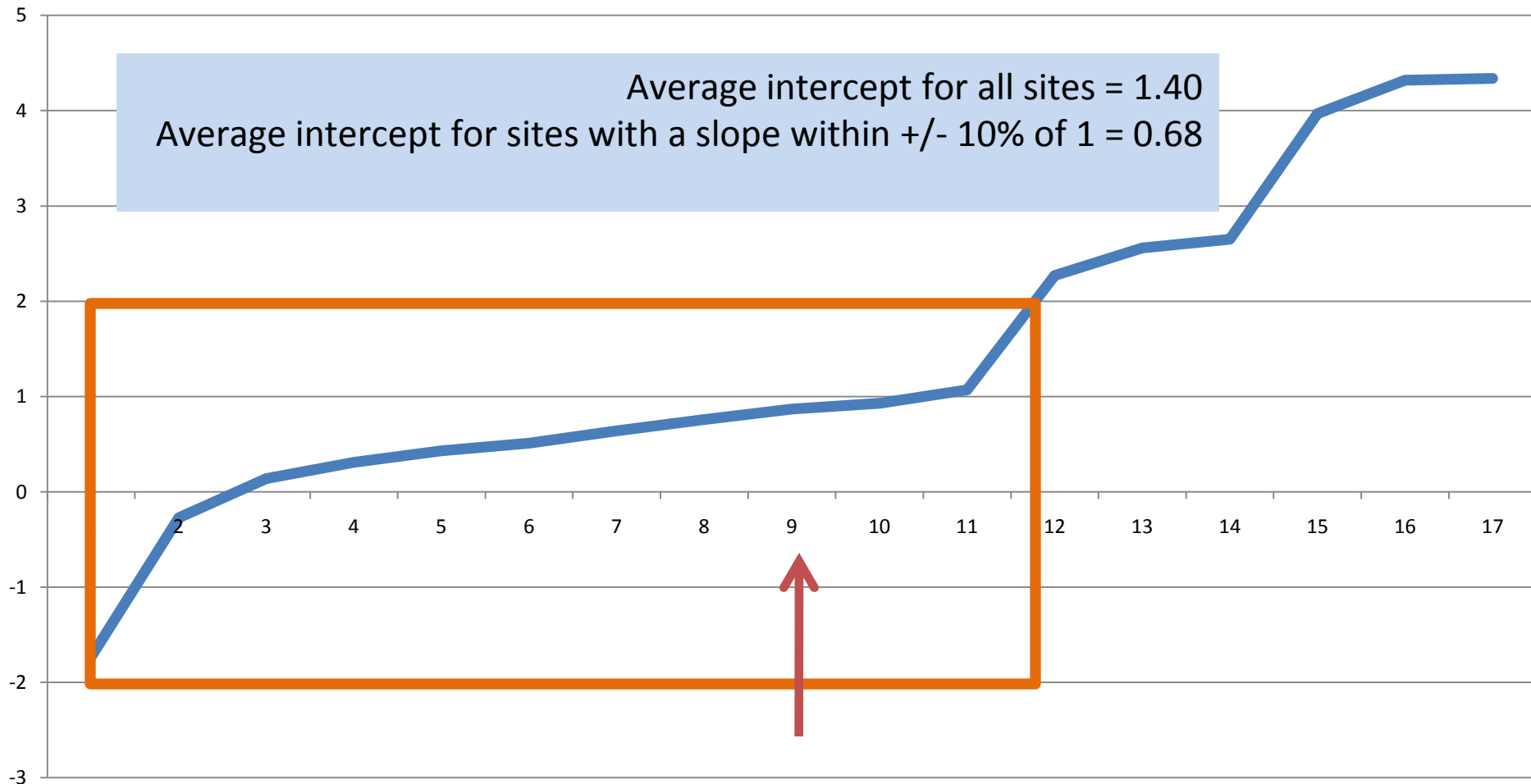
Slope



8500C FDMS - FEM

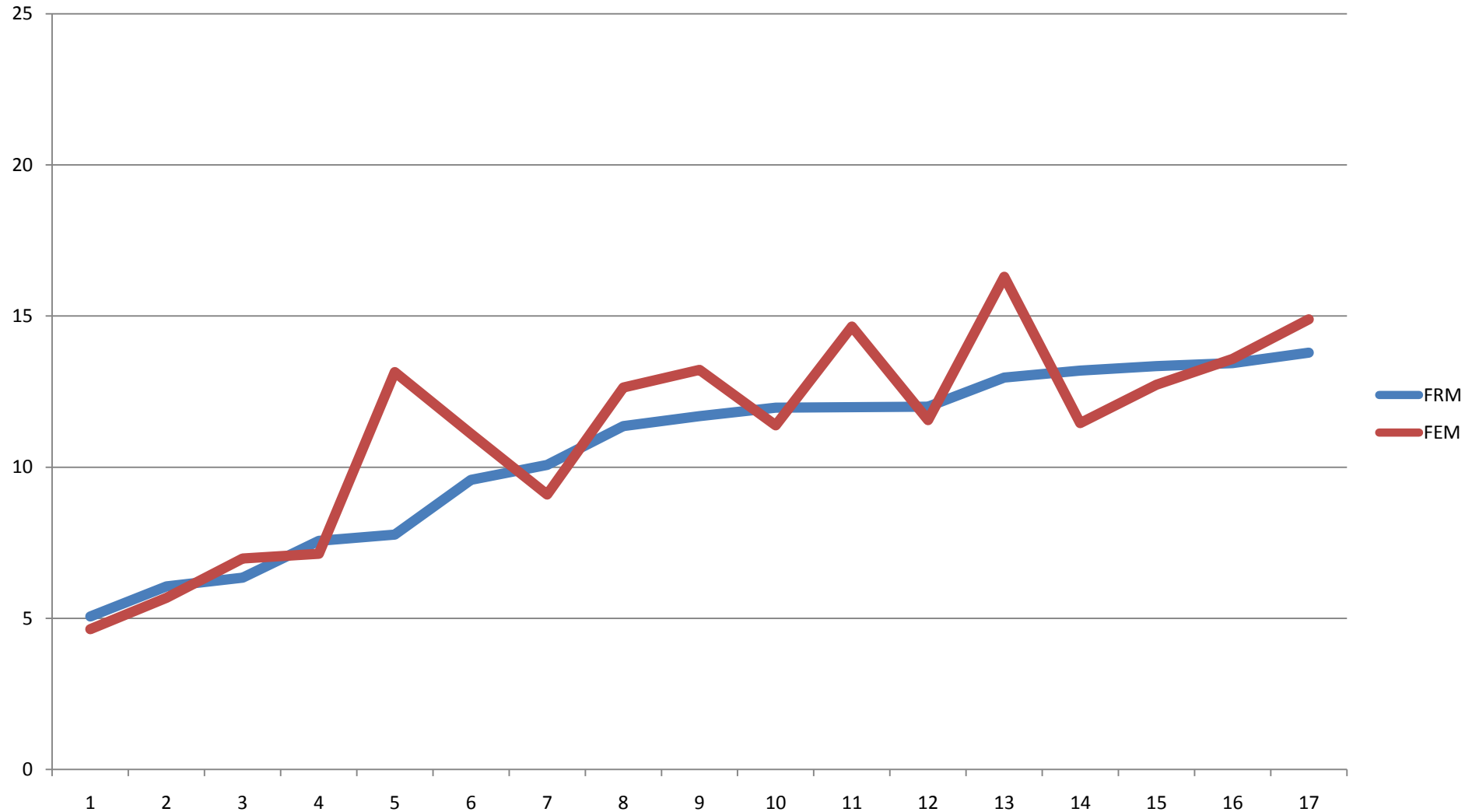
Intercept ($\mu\text{g}/\text{m}^3$)

Average intercept for all sites = 1.40
Average intercept for sites with a slope within $\pm 10\%$ of 1 = 0.68



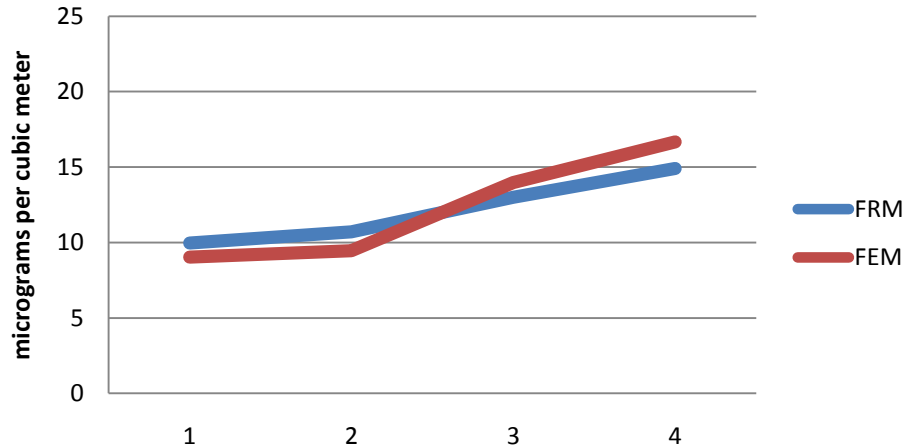
8500C FDMS – FEM

Mean Concentration – All Seasons

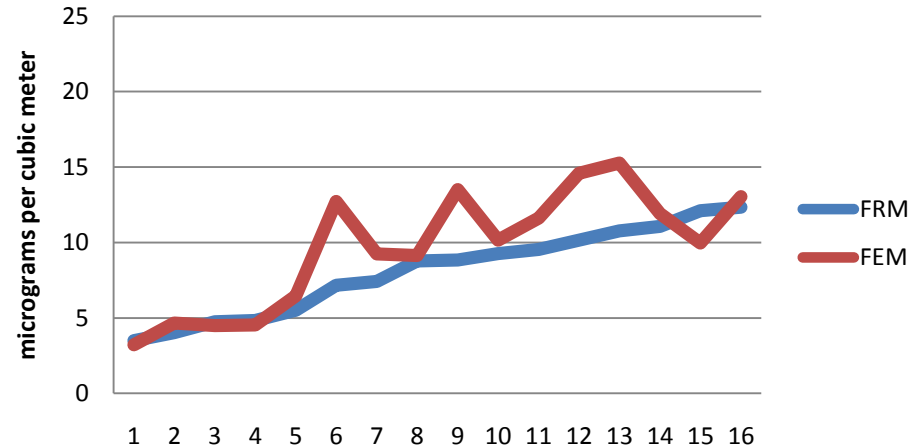


8500C FDMS - FEM

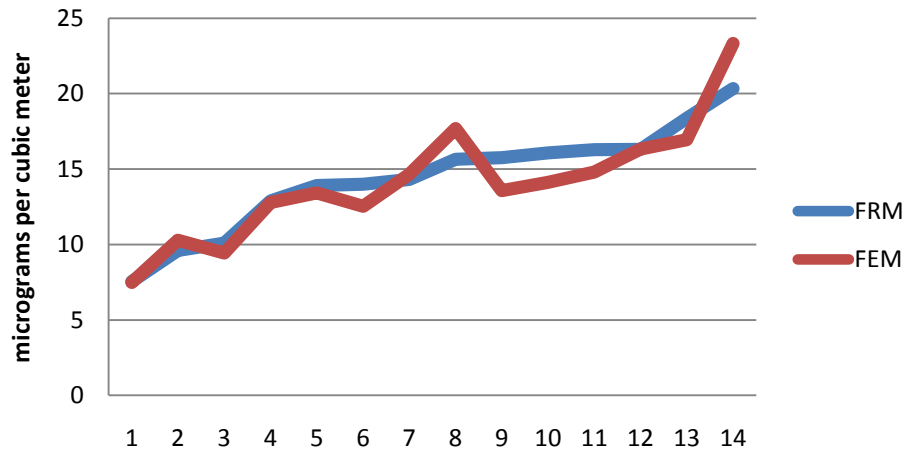
Mean Concentrations for Fall



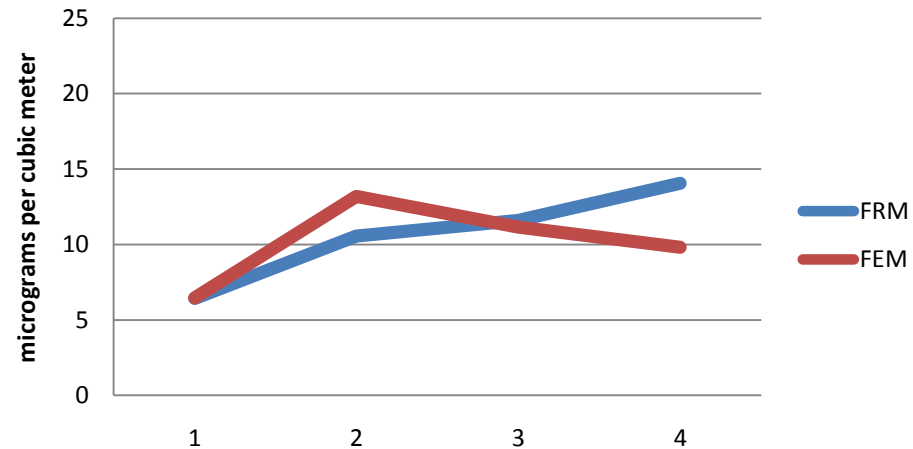
Mean Concentrations for Spring



Mean Concentrations for Winter



Mean Concentrations for Summer



Communications:

- **What Planning and Communications have taken place?**
 - EPA – OAQPS and ORD have been meeting to review data assessments and plan next steps
 - Ambient Air Monitoring Steering Committee
 - AAMSC sub-group with OAQPS, MD, BAAQMD, NYS
 - Discussed with full Steering Committee in SF on December 2.
 - Assessments sent to Regional Offices in December, 2010; asked that they be shared with States.
 - Met, discussed assessments, and received input with each of instrument companies at NAQC in March of this year.
 - Coordinating with Regional and Multi-State orgs to cover material at several Spring Meetings
- **What Planning and Communications need to be scheduled?**
 - Need to reach out and provide information on assessments to:
 - FEM users
 - **Need to make assessment information available to monitoring agencies contemplating purchase of new FEMs**
- **What information would be useful to collect from users to help inform this process?**
 - Key setup, maintenance, and internal diagnostic information (e.g., RH on Met One BAM from periods of high bias when weather was warm/hot).

Initial Thoughts on a Framework to Manage PM_{2.5} FEM Data Quality

1. Assess Data Quality

- Acceptable – Continue Reporting Data
- Not Acceptable – Review set-up and Operations

2. Review of Setup and Operations

- Issues found - Resolve any issues and collect more data
- No issues found – Coordinate with Instrument Company

3. Coordination with Instrument Company

- Work with instrument company to address any issues found with monitor
- Compare data quality with other monitoring agencies having similar aerosol and climate

Action Items

Discussed with Steering Committee:

Completed:

- ✓ Reach out to instrument manufactures to inform them of mixed data quality and ask for input on how to best resolve issues that can be resolved.
- ✓ Reach out to Canada for input on their experiences with the GRIMM.

In Progress:

- ✓ Communicate results of assessments to monitoring agencies.
- ✓ Solicit detailed FEM operational information through questionnaire.

Future:

- Need for quick assessment that an agency can initiate on the quality of their data compared to DQOs and Part 53 FEM criteria?
- Develop confidence interval around NAAQS decision given FEM data quality as found.
- Development of a concise and straightforward document on what to do if your data quality is suspect or not acceptable?
 - e.g., on the Met One BAM what are the things you can look to investigate if your slope is acceptable and your intercept is unacceptable?
 - verify zero test data was entered correctly in instrument
 - check to make sure that if using analog connections you are accounting for the appropriate range of the electrical signal to match the range of the concentrations
- Longer term - develop instrument specific Technical Systems Audit (TSA) checklists.
- Do we need to update our Technical Note on data reporting?
- Other?

Next Steps

1. Have monitoring agencies review questionnaires and provide feedback on their set, operation, maintenance, and data reporting.
 - Need to determine if we will work through Region or Multi-State org?
2. Write up recommendations from instrument companies and key insights learned from questionnaires to develop Best Practices for set-up, operation, maintenance, and data reporting that can be appended to monitoring agency SOP's and/or QAPP's. Share this information with monitoring agencies.
3. Recommend Monitoring agencies specifically address if they are or are not planning to use a continuous PM_{2.5} FEM as a primary monitor in upcoming annual monitoring network plans.
 - Where PM_{2.5} continuous FEMs are demonstrated to meet the Part 53 performance criteria used to approve the instrument by comparing to collocated FRMs in an agencies network, we support use of the continuous FEM as a Primary monitor.
 - In cases where a PM_{2.5} continuous FEM is not meeting the part 53 performance criteria, we recommend keeping the PM_{2.5} FRM as the Primary monitor while working towards improvements in FEM data quality.